Fall 2016 Physics 342 CRN 22647

Professor
Dr. Jared Workman

Class Location
WS 366

Class Hours

Tue & Thu 11:00-12:15

Text Book
Classical Dynamics of Particles and Systems Marion and Thornton

Course Website
http://org.coloradomesa.edu/~jworkman/teaching/fall18/342/index342.php

Welcome to Physics 342, Advanced Dynamics

Classical Mechanics is the study of the motion of macroscopic objects and can be neatly divided into two disciplines, namely, statics and dynamics. In this course we will be primarily concerned with a study of the latter.

Dynamics is the study of the physical laws that determine the motion of a material particle or a system of particles. In addition to developing a more sophisticated treatment of mechanics via Newton's laws of motion, we will also examine the equations of Lagrange and Hamilton to describe these same physical laws.

What We Will Cover will be drawn from

- Newton's Laws of Motion
- Projectiles and Charged Particles
- Linear and Angular Momentum
- Energy
- Calculus of Variations, Lagrange's Equations, and Hamiltonian Dynamics
- Gravitation
- Two Body Central Force Problems
- Dynamics in non-inertial Frames
- Dynamics of Systems of Particles
- Solid body Dynamics
- Non-Linear Dynamics
- Additional Topics applying mechanics to astrophysical systems

Here is CMU's course catalog description:
From the catalog…
"In-depth survey of classical mechanics. Includes Newtonian dynamics, conservation laws, oscillating systems, gravitation, the Lagrangian and Hamiltonian formulation of mechanics, orbital and central force motion, systems of particles, non-inertial reference frames, rigid bodies, coupled oscillations, and waves on a string.

Prerequisites: PHYS 230 and MATH 260 or Math 236"

What to look for in this syllabus

- How to contact me
- Evaluation (grades)
- Late or missed work/exams
- Homework
- Exams
- Attendance
- Schedule
- Resources for student assistance
- Student Conduct
- Important Dates
- Work Load Expectations
- Course Learning Objectives
- Program Level Student Learning Objectives

How to Contact Your Instructor

Visit my office: WS 230C
Office Hours: Wed/Fri 11:00-12:00, Tue/Thu 9:00-10:00, & Mon 12:00-1:00 or by appointment.

Leave me a message at: (970)-248-1327
Email me at: jworkman@coloradomesa.edu (better than the phone)

Evaluation

Homework 44%
Exams 36%
Project 20%

Grading

Grades will be assigned as follows:

Excellent	A	> 90%
Good	B	80%-90%
Average	C	70%-80%
Deficient	D	60%-70%
Failing	F	< 60%

A curve may be used at the end of the semester. I can be contacted at any time to give you an update of your current grade.

Late or Missed Work/Exams

Missed exams will be automatically assigned a grade of zero. I can be contacted PRIOR to an assignment/exam date if flexibility is needed however any missed work will require documentation to be excused. Homework will be penalized at a rate of 25% per day late and is due at the **beginning** of class on the assigned day.

Homework

- There will be roughly one assignment per week consisting of approximately 4-8 homework problems per assignment. Assignments are to be turned in by the beginning of class on the date due. Late assignments will be penalized by a 25% grade reduction each day they are late. Additional late day penalties will be assigned every 24 hours from the initial due date.
- You are encouraged to discuss homework problems with your classmates. Working problems with your peers is an excellent learning method, however, anything turned in **must** be your own work. If you have worked with other students at the blackboard and I see identical solutions the credit will be split amongst the participants. Ex – 100 percent correct with 2 identical solutions = 50% per student, with 3 participants = 33% per student.
- Homework is worth 44% of your grade.
- There is a great deal of freely available solutions to everything in almost any book on the internet. It is impossible to prevent you from looking at solutions online however I will assign a grade of zero for any problem that is blatantly copied from solutions. You may use solutions to guide your problem solving efforts but I expect you to understand the steps and how to come about the answer. If your solution to a problem is shorter than mine expect a zero on that assignment.
- I will disenroll any student who falls below a cumulative 60 percent on the homework grade for two consecutive assignment.

Exams

There will be two to three exams. The exams are worth 36% of your grade.

The Final Exam date is from 10:00-11:50 on Tuesday, December 11th. Your project will be presented during this time

Project

You will be required to complete a project that will include a written report and a presentation to the class during the final exam period. This project will entail the numerical study of some aspect of classical mechanics.

You may pick any topic you find interesting.

Suggestions include but are not limited to:

- Non-linear Systems
- Orbital dynamics
- Fluid dynamics
- Non-Inertial reference frame dynamics
- Systems of coupled oscillators
- Any interesting topic you clear with me

Essentially I want you to: either pick something you need to plot using a computer to truly see and/or solve some equations numerically and plot their results. I will require you to come and sit down with me for guidance after your topic has been chosen as I will explicitly outline what I want you to do.

You may use Excel, C, Matlab, Maple, python, existing software, etc. to generate your results.

The project itself will require you to submit a final paper to me (17.5% of your total class grade) and a present the topic to the class during the final exam period (2.5% of your total class grade).

Paper

The paper should be at least 10 pages with text and figures and include

- A description of the physics you are modeling/solving, include any and all relevant derivations, include why you chose this topic
- A description of the methods you used to generate your results
- Your results plotted in a readable and understandable format • A discussion of how the numerical exploration and visualization extended your knowledge on this topic beyond the pencil and paper methods used in class
- Essentially – INTRODUCTION, METHODS, RESULTS, CONCLUSION/DISCUSSION
- You will be graded on content, clarity, grammar, spelling, complexity, and demonstrated level of understanding of the topic.
- The paper is worth 17.5% of your class grade with the majority of this grade being based on the actual work done on the project and it's presentation in the paper.

Presentation

I expect the presentation to last 15:00- 20:00 minutes and require you to have me watch your presentation beforehand. Aim the presentation at your fellow students. I want you to teach them something new. The presentation is worth 5% of your grade. Make it good.

Dates (the following dates are the due dates for portions of this project)

- September 20th – Pick a topic and clear it with me (1% of paper grade)
- October 25th – A two page preliminary report containing a description of your topic as well as preliminary numerical results and numerical methods. I want to see that you have at least picked or started writing your code/scheme and know how to use it to produce results. (4% of paper grade)
- November 15th and December 6th - You must submit two drafts of your final paper. 1st, write up a rough draft of your project in it's entirety. Have someone who already has at least a bachelors degree read and mark up this copy for corrections. Submit this copy to me on the 15th of November. Second, retype the paper fixing the suggested modifications and submit the corrected copy to me on the 6th of December. I will give a flat 3% for the first marked up draft and will then read and score the second draft which will be worth up to 7% of the project grade. I will grade on completeness as well as grammar. PLEASE NOTE – you will be writing a total of three drafts of your paper: preliminary, corrected once, and the final paper.
- The week of December 3rd – schedule a time during the last week of classes to give me a trial presentation. There is no credit for the trial presentation however I will not allow you to present your work if you skip this step. This will result in a zero on the presentation portion.

- Both the final paper and the presentation are due at the last class of the semester BEFORE finals week. Late papers will be penalized one letter grade per day late.

You will be penalized 1% of your paper's grade every day after each deadline date posted above passes.

You may, after checking with me, work in pairs of two but then all lengths of submitted work are doubled – 20 page paper, 30-40 minute presentation. If you work in pairs I expect twice the result of individual efforts.

I will be happy to provide continuous feedback throughout the course of the semester. This is ¼ of your grade, DO NOT wait until the last minute. Please take this project seriously, you will be using your knowledge of physics and computers in any job you take outside of school unless you leave the scientific/engineering fields.

Attendance

This is up to you but you are more likely to pass if you show up.

Resources for Students

Your instructor: I am here to help you learn; please let me know if you are having trouble with anything! My contact information is at the top of the syllabus, or you can talk to me after class or during my office hours.

The Course Website: Contains all class information and several helpful (and some just fun) links.

Tutorial Learning Center: HH113 http://www.coloradomesa.edu/tutoring/index.html

Students With Disabilities: Students with disabilities have certain privileges extended to them including but not limited to extended exam time. It is your responsibility to contact the EAS (Educational Access Services)
At Houston Hall, Room 108, 1-970.248.1856 http://www.coloradomesa.edu/eas/links.html and bring me the necessary forms for any special dispensations received.

Class Policies

All students expected to follow the Student Code of Conduct. Violations of the Student Code of Conduct may result in disciplinary action. The code of conduct is here here http://www.coloradomesa.edu/academics/policies/academic_integrity.html. Some specific items that are important in this class are:

1. Create and sustain a respectful learning environment. Allow your fellow students to learn and the instructor to teach. Disrespectful, disruptive or abusive behavior toward an individual or group is unacceptable.
2. Due to the rapid pace of this course, late work is generally not accepted. In the event of illness, family emergency or other special circumstances, you must contact me BEFORE the deadline to make arrangements for late work or early tests. At the instructor's discretion, you may then turn in the work within 1 week of the deadline.
3. I encourage participation, ask questions, email me, ask for reading material for your own edification after the course is over, provide me with feedback. I am not directly grading you on participation but it will play a factor in the end of the semester grade. This is an interesting topic and I want you to be involved in learning it.

4. Turn off your cell phone.
5. No smart phones, ipads, earphones, etc during class time, no texting or web browsing. You all get one freebie phone ring then I may ask you to leave.
6. Laptops are fine for note taking but please do not web surf during class. If I find you surfing the web you forfeit your laptop privileges. Students using laptops are required to sit at the front of the class.
7. I will turn any students I find cheating, copying each other's work, or plagiarizing material over to the department chair, no exceptions. If you are unsure if something is prohibited, ask me. You are encouraged to work together but please do not hand in identical assignments, they will not be accepted.
8. Please arrive to class on time and wait until class is over to leave. I reserve the right to tell students to leave who are tardy. I will also penalize students who leave class early UNLESS I am forewarned.
9. No conversations with classmates in class.
10. I do not track attendance however I am aware who is and is not coming to class. If you choose not to come to class please do not come to me asking why your grade is suffering.
11. Finally – YOU are responsible for knowing what is due when. I will not make students who miss material aware of what was missed. This information is available in a plethora of places. If you aren't sure of what or when something is due the onus is on you to find out.

Important dates:
http://www.coloradomesa.edu/registrar/dates.html

Work Load Expectations:
An undergraduate student should expect to spend on this course a **minimum** of two hours outside the classroom for every hour in the classroom. The outside hours may vary depending on the number of credit hours or type of course. More details are available from the faculty member or department office and in CMU's Curriculum Policies and Procedures Manual.

Course Learning Objectives:

A student who has taken this course will demonstrate the ability to:

1. Translate between verbal and mathematical descriptions of physical situations. Apply mathematical reasoning, using vectors, vector calculus, and the calculus of variations, to analyze these situations.
2. Construct free-body diagrams and apply Newton's Second Law to analyze the dynamics of physical situations involving a single particle.
3. Apply the conservation theorems, namely, conservation of linear momentum, angular momentum, and energy of a particle in a conservative force field, to analyze the dynamics of physical situations involving linear and/or rotational motion.
4. Apply Newton's Law of Gravitation to a system of particles and extended objects.
5. Construct Lagrange's equations of motion for various physical phenomena.
6. Use the Hamiltonian method to find the equations of motion for various physical phenomena.

Program-Level Student Learning Objectives:

This course satisfies the following Physics-degree student learning objectives:

1. Articulate the knowledge base and show fluency with the ideas and techniques of the major fields of physics (classical mechanics).
2. Translate physical problems into mathematical problems, solved these using appropriate mathematics and extract physically meaningful statements from the solutions.

Disclaimer: The instructor reserves the right to modify this syllabus and schedule.